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The Economic Value of Birds.

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It is a matter of common observation that a great many of our birds are becoming more scarce each year, so much so that a few species are even now on the verge of extinction. Each succeeding year brings with it a new crop of eager sportsmen "anxious to kill and ambitious to make records." But the time has come when the small boy with his rifle and the hunter with his gun must be taught that henceforth all birds must be protected or they will be exterminated.

At the request of the New York Zoological Society, Mr. Wm. T. Hornaday, made a careful study of bird-life in the United States with special reference to its increase or decrease during the fifteen years ending with the year 1898. This was the result: only four states, Kansas, Wyoming, Utah and Washington, showed a slight increase in bird-life; thirty states showed decreases varying from ten per cent to ninety per cent, the general average decrease being forty-six per cent. In Indiana the decrease of bird-life was found to be sixty per cent. That was in 1896. Since then another inquiry has been made and, according to this last report, the volume of bird life has changed so slightly that in 1903, conditions were practically as they were in 1898. Indeed some investigators assert that during the past fifteen years the number of our common song birds has been reduced by one fourth. Another author † claims that "at the present rate, extermination of many species will occur during the lives of most of us. Already the passenger pigeon and Carolina paroquet, only a few years ago abundant, are practically exterminated."

This alarming decrease in the number of birds is due to various

* December 15, 1909.—Pages 105 to 144.

† Chester A. Reed in his Bird Guide.

causes such as winds. snow and wild or domestic animals. But by far the greatest number of birds is destroyed by man himself. Now it is not the purpose of this article to arraign mankind for its barbarity towards birds but merely to show the importance of some of our common birds in the economy of nature and thus point out a few reasons for their preservation.

The great utility of birds lies in their capacity for destroying insects. From time immemorial, man has but feebly combated the insect pest, and it is the birds alone that can check its ravages; hence, destroy the birds and insects will multiply enormously as history only too plainly proves. Much has been written about the destructiveness of insects and economic entomologists are constantly adding new species to the long list of pests that destroy our crops.

The first report of the entomologist of New York,* contains a list of 176 species of insects that destroy apple trees, while the species that destroy plum, pear, peach, and cherry trees are hardly less numerous.

Kaltenbach gives an extensive list of insects that infest the trees of central Europe.† According to this authority, the oak is a prey to 537 species of insects; the elm to 107; the poplar to 264; willows to 386; birches to 297 and beeches to 154.

While the forest destroying insects of our country have not been studied as long as those of Europe some very astonishing discoveries have been made. Dr. Packard ‡ lists over 400 species which are destroying our oaks and expresses his belief that this number represents, perhaps, only one half of the species actually in existence. He places the number of species that attack the hickory at 140; those that ravage the maple at 85; the poplar at 72 and those that live on the pine at over 100 different kinds.

The species of insects which feed on grasses, cereals, field and garden crops are enormous in numbers and each succeeding year adds new names to the list. The loss occasioned by these pests reaches far into the millions of dollars annually. Packard says that "we lose annually by the attacks of insects on agricultural products not far from one hundred millions of dollars."

The Bulletin of the New York State Agricultural Society for the year 1854 shows a loss of fifteen million dollars through the rav-

* Report of the Commissioner of Fisheries and Game for Ind. Page 980.

† Ibid.—Page 981.

‡ Packard, A. S. Entomology for Beginners. Pp. 191.

ages of the insignificent wheat midge, (*Diplosis tritici*) two years later, in one county of the same state, two thousand acres that would have yeilded 60,000 bushels of wheat were destroyed by the same insect.

The Hessian Fly (*Cecidomyia destructor*) has also caused great devastation in the wheat belt. On the valuation of the crop of 1904, according to statistics furnished by Dr. Marlott, the loss occasioned by this fly alone amounted to almost fifty million dollars while four years previous to that date, the loss in the wheat growing states from this tiny midge approached one hundred million dollars.

Another pest which destroys many of the staple crops in the Mississippi valley is the cinch bug (*Blissus leucopterus.*) The last report of Z. T. Sweeney, commissioner of Fisheries and Game in Indiana, contains statistics of this insect compiled by Drs. Schimmer and Riley. According to this report, the loss caused by the cinch bug in one year, 1864, in the Mississippi valley was one hundred million dollars, while the loss in Illinois for that year reached seventy-five millions.

The cotton industry has a powerful enemy in the ordinary cotton worm (*Alabama argillacea*) which has been known and feared for more than a century. The report of the Massachusetts Board of Agriculture for 1906 says in regard to this pest; "The average loss in the cotton states from this caterpillar for fourteen years following the Civil War was estimated at fifteen million dollars per year.

These are but a few of the striking examples of destruction occasioned by ordinary pests which our birds are destroying. The reports of our boards of agriculture contain numerous cases of insect ravages, not as great as these, perhaps, but still alarmingly large and calculated to make men consider the question of preserving the birds.

When these startling losses are considered it is readily seen how birds operate to prevent injury to our crops. Of course to accomplish this it is necessary that birds be present in sufficient numbers; and yet these numbers need not be very large in proportion to the insects for each bird devours an incredible number of insects. Chester A. Reed says, "It has been found by observation and dissection that a cuckoo consumes daily from fifty to four hundred caterpillars while a chickadee will eat fron two hundred to five hun-

dred insects, or up to four thousand insect or worm eggs." The same author has undertaken a very careful study of bird life in Massachusetts and his conclusion is that there are about five insect eating birds per acre in that state. The daily consumption of insects by these 25,600,000 birds, is 2,560,000,000. To the average reader, these figures contain little more than an idea of vastness and for that reason Reed has translated them into simpler language. He says, "About 120,000 insects fill a bushel measure. This means that the daily consumption of chiefly obnoxious insects in Massachusetts is 21,000 bushels. This estimate is good for about five months in the year."

The common meadow lark (*Sturnella magna*) has been studied with reference to its capacity for destroying injurious insects and the result has been surprising. The investigation which furnished evidence for the bird's usefulness consisted of a laboratory examination of "two hundred and thirty-eight stomachs collected in twenty-four states, the District of Columbia and Canada." Insect food was found to be 71.7 per cent as compared with 26.5 per cent of vegetable food. In other words, almost three-fourths of this bird's food for the entire year consists of insects. Grasshoppers, locusts and crickets appear to be the usual diet of the lark, the average amount consumed during the year being about 29 per cent of all food. An interesting chapter might be written about the lark as a destroyer of injurious grasshoppers. Here is a calculation from Dr. Fisher. He states that "the weight of an average grasshopper is 15.4 grains and its daily consumption of food equals it own weight. It is safe to assume that fifty grasshoppers are eaten each day. Now if the number of birds breeding in one square mile of meadow land is estimated at five pairs, and the number of young that reach maturity at only ten in all, there will be twenty birds on the square mile during the grasshopper season. On this basis the birds would destroy 30,000 grasshoppers in one month. Assuming that each grasshopper if left alone would have lived thirty days, the thousand grasshappers eaten by the larks each day, represent a saving of sixty-six pounds of forage a month. If the value of this forage is estimated at ten dollars per ton the value of the crops saved by meadow larks on a township of thirty-six square miles each month during the grasshopper season, would be about three hundred and fifty-six dollars.

But grasshoppers are not the only insects eaten by the lark.

Beetles constitute about 18 per cent of the animal food of this bird. Among the most important of these are the May beetle, (*Scarabaeidae*) a family which contains some of our most injurious insects. In the month of May, 21 per cent of all the food of the Lark consists of these beetles.

Bugs, (*Hemiptera*) and especially those belonging to the family of Stink bugs (*Pentatomidae*) are eaten throughout the year, constituting about 4 per cent of all the food; yet, in May this percentage rises to fourteen.

From the forgoing it will be seen that this bird is pre-eminently an insect eater and hence an important factor in the preservatiou of our crops. For this reason it should be protected.

The meadow lark is only one of the great army of insect destroyers; other birds are just as useful in this capacity. Even in the apparently destructive career of the crow there are compensations. It is a great feeder on May beetles the larvae of which, known as white grubs, burrow in the ground and devastate grass lands and injure the roots of trees and plants. Robins feed largely on cut worms as well as on the white grub of the Mey beetle. Blue Jays are extremely efficient as caterpillar hunters; warblers, titmice and vireos are hardly less expert. And so on down the long list, we find that each bird has some part in the economy of nature.

The great question is, how can we protect the birds? The game laws of the states are good but the difficulty lies in enforcing them. The remedy lies in education. People must be educated to realize the economic value of the birds. This knowledge, more than anything else, will materially lessen the desire to destroy birds and will preserve one of our nation's most valuable assets.

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Priority of Names of Certain Families of Plants.

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It seems to be understood that historical priority has become the rule for the acceptance of the names of plant families at least since the year 1753. Some botanical works have begun to mention

or append dates as well as names of authors to whom the family names are to be attributed. I have noted, however, that some of these authors have been antedated, and I herewith give a partial list of such names, mentioning particularly names which conform to the general usage; that is those that end in *aceae*. Should we assume that names of families be accepted such as *Labiatae*, *Leguminosae*, *Umbelliferae*, *Cruciferae* which do not end in *aceae*, possibly a larger list might be obtainable. The best botanists, sanctioned by the rules of the Vienna Congress, approve of the aforesaid names. Many names of families as now accepted are pre-Linnaean in their origin, and forms like *Glandiferae* Caesalpinus, 1583, for the Oak Family, (*Fagaceae*, Drude 1879); *Orchideae* Linnaeus, 1751, for *Orchidaceae*, Lindley, 1836, *Caryophylleae*, Gerard, 176:, *Pomiferae*, Ray, 1682, and C. Bauhin 1623, *Bacciferae*, Morrison, etc., are as old and as acceptable as the names *Leguminosae; Umbelliferae*, *Labiatae*. It seems, however, to be the self assumed privilege of modern botanists to be above all things inconsistent in this matter.

Other systematists have of late discarded the time honored names, *Leguminosae*, *Cruciferae*, *Umbelliferae*. *Labiatae* and substituted such of their own names as *Fabaceae*, *Brassicaceae and Lamiaceae*. *Arundinaceae* was used by John Ray, for *Gramineae*, and it conforms to the modern views. *Rotaceae* the older name for *Primulaceae* even since 1753, *Oleraceae*, *Nucamentaeeae*, *and Campanaceae* can not then be reasonably objected, to except that in our ignorance of them we have so long overlooked them. Nothing short of empirical assumption of lawlessness and inconsistency can excuse from the acceptance of such names on the basis of historical priorty even since 1753, the so-called "starting point" in our present ideas of nomenclature.

I give herewith a list of family names giving in parentheses as synonyms the commonly accepted later ones.

(1) *Campanaceae*, Zinn, 1757.*
Also *Campanaceae*, Gerard, 1761.†
(*Campanulaceae*, Jussieu, 1789.)

(2) *Tiliaceae*, Gerard, 1761.†
(*Tiliaceae*, Jussieu, 1789.)

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* Zinn, Catalogus Plantarum Horti. Acad. Agri. Göttengensis, 1757.
† Gerard, L., Flora Galloprovincialis, 1761.

(3) *Ranunculaceae*, Gerard, 1761. †
(*Ranunculaceae*, Jussieu, 1789.)

(4) *Cucurbitaceae*, Linnaeus, 1754.‡
Also *Cucurbitaceae*, Zinn, 1757.* and Gerard 1761.†
(*Cucurbitaceae*, B Jussieu, 1789.)

(5) *Dipsaceae*, Zinn, 1757.*
Also *Dipsaceae*, Gerard, 1761.†
(*Dipsacaceae*, Lindley, 1836.

(6) *Solanaceae*, Zinn, 1757.*
Solanaceae, Gerard, 1761.†
(*Solanaceae*, Persoon, 1805.)

(7) *Cichoraceae*, Zinn, 1757.*
Cichoraceae, Gerard, 1761.†
(*Cichoriaceae*, Reichenb, 1831)

(8) *Papilionaceae*, Linn, 1754. ‡
(*Papilionaceae*, Gerard, 1761.†)
Papilionaceae, Linn, 1764.)

(9) *Liliaceae*, Zinn, 1757.*
(*Liliaceae*, Adanson, 1763.)

(10) *Rotaceae*, Linn, 1754.‡
Rotaceae, Zinn, 1757*
Rotaceae, Gerard. 1461.
(*Primulaceae*, Ventenat, 1799.)†

(11) *Holeraceae*, Linn, 1754. †
Oleraceae, Zinn, 1757.*
Oleraceae, Gerard, 1761.†
(*Chenopodiaceae*, Dumortier, 1829.)

(12) *Drupaceae*, Linn, 1754.*
(*Drupaceae*, DC, 1805.)

(13) *Pomaceae*, Linn, 1754.‡
(*Pomaceae*, Linn, 1764.)
Pomiferae, Zinn, 1757,* and Gerard, 1761.†

(14) *Epilobiaceae*, Ventenat, 1799.
(*Onagrarieae*, Jussieu, 1804.)||

‡ Linne, C. V., Philosophia Botanica, 2nd edition, 1754, pp. 27-36.
|| Ventenat, Tabl. du Reg. Veget III. 1799.

(*Onagrideae*, Dumortier, 1827.) §
(*Onagraceae*, Dumortier, 1829.)

(15) *Utriculariaceae*, Dumortier, 1829.¶
(*Pinguiculaceae*, Dumortier, 1829.)
(*Lentibularieae*, Rich, 1808.)
(*Lentibulariaceae*, Lindley, 1847.)

(16) *Nucamentaceae*, Linn, 1754. ‡
Nucamentaceae, Zinn, 1757.*
(*Ambrosiaceae*, Reichenb, 1828.)

(17) *Asperifoliae*, Linn, 1754.‡
Asperifoliae, Zinn, 1757.*
Asperifoliae, Gerard, 1761.†
(*Boraginaceae*, Lindley, 1836.)

(18) *Umbelliferae*, Zinn, 1757.*
(*Umbelliferae*, B. Jussieu, 1759.)
Also *Umbelliferae*, Gerard, 1761.†

(19) *Columniferae*, Zinn, 1757.*
(*Malvaceae*, Necker, 1770.)

(20) *Orchideae*, Linn, 1754.‡
Orchideae, Zinn, 1757.*
Orchideae, Gerard, 1761.†
(*Orchideae*, Lindley, 1836.)

(21) *Juncoideae*, Gerard, 1761.†
(*Juncaceae*, Ventenat, 1799.)

(22) *Melanideae*, Gerard, 1761,†
(*Violaceae*, DC. 1805.)

(23) *Caryophylleae*, Zinn, 1757.*
Caryophylleae, Gerard, 1761.†
Caryophyllaceae, Reichenb, 1828.

(24) *Cyperoideae*, Zinn, 1757.*
(*Cyperaceae*, St. Hillaire, 1805.)

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§ Dumortier, B. C., Florula Belgica, Staminacia, 1827.
¶ Dumortier, B. C., Anal. Fam., 1829.

Notes on Populus, Plinius.

IVAR TIDESTROM.

I. POPULUS ALBA.

The genus Populus as understood by Plinius embraced three species, the concepts of which have in some measure survived to the present day. It is true, however, that the terminology has changed and that the word genus was applied to what is nowadays considered a species, but the Plinian application of the word is after all a right one when judged from a strictly linguistic point of view.

That Plinius understood the species (genera) and grouped these naturally, we may infer from the following citation from Historia Naturalis: *Populi tria genera: alba ac nigra et quae Libyca appellatur, minima folio ac nigerrima fungisque enascentibus laudatissima. alba folio bicolor, superne candicans, inferiore parte viridi. huic nigraeque et crotoni in inventa circinatae rotunditatis sunt, vetustiora in angulos exeunt.* (Plin. Hist. Ch. 16, 23.)

Of the above mentioned species the first two still bear the Plinian names; *Populus alba* and *Populus nigra* respectively. *Populus Libyca* has been cited by many pre-Linnean authors as a synonym of *P. pulus tremula.*

The name *Populus* is of uncertain origin. In the Slavic languages *P. alba* is known by the name *topol* or *topola;* and it is possible that the Latin name is an adaptation from some Oriental language as the species is held to be a native of Asia. According to Plinius Populus was dedicated to Hercules. This is evident from many passages in the works of the classic writers.

"*Arborum genera numinibus suis dicata perpetuo servantur, ut Jovi Aesculus, Appollini Laurus, Minervae Olea, Veneri Myrtus, Herculi Populus.*" (Plin. Hist. 12.)

That *Populus alba* in particular was dedicated to Hercules we gather from Virgilius and other writers: * * "*Herculea bicolor cum populus umbra | velavitque comas foliisque innexa pependit | et sacer implevit dextram scyphus.*" * * Virg. Aen. 8.

"*Populus Alcidae gratissima, vitis Iaccho | formo*(n)*sae myrtus Veneri, sua laurea Phoebo;*" Virg. Ecl. 7.

In the Greek mythology and literature we meet with *Populus alba* under the name 'Αχερωΐς so called because it was said to have been discovered along the river Acheron. It was also called λευκή by Homer, Theophrastus and numerous other Greek writers. The latter name is still applied to *P. alba* in Greece. Another tradition tells of Leuce, the daughter of Oceanus whom Pluto fell in love with and carried off to the infernal regions, being changed after her death into a white poplar.

In Stapel's Commentaries (Stapel. Theophr. Hist. 217. 1644.) we find the following interesting legend from Theocrites. "*Olympionicus inquit Herculem cum ad inferos descenderet, invenisse circa Acherontem inferni fluvium, nascentem populum albam, eamque ad homines portasse, quam Homerus id circo aeheroida vocavit.*" (Theocrites) "*Narrant ex hac Herculem sibi fecisse coronam, eamque capiti imposuisse. Hinc folii partem superiorem porracei seu viridissimi coloris esse, ita ut nigra propemodum videatur ac propter fuliginem ac caliginem terri fumi obscura adeo facta: alteram vero partem, quae temporibus adhaesit, a sudore abluto exalbuisse.*"

Sibthorp (Fl. Graec. Prodr. 2:260.1813) recorded *Populus alba* from Greece and according to him the name λευκή was still in use.

In the works of Dioscorides we find no description of *Populus alba* but a great deal about its medicinal uses.

That λευκή of the Greeks was identical with *Populus alba* of the Romans there is little doubt:

"*Leucen Romani albam Populum dicunt.*" * * Marcellus Virgilius, Diosc. 14. 1523.

There has been and is still some diversity of opinion as to the identity of *Populus alba*. The name has been applied to a number of forms varying from what we regard as *P. alba* to *P. tremula*. Intermediate between these we have *P. canescens* which latter has been mistaken for the true *P. alba*.

One of the earlier records of *P. canescens* is to be found in the works of Lobelius. It is illustrated in Pl. seu Stirp. Ic. 2:193. 1581 and named *Populus alba minoribus foliis*, while *Populus alba* received the name *Populus alba latifolia*. The illustration of the latter shows leaves characteristic of *P. nivea* Willd. Similar illustrations of *Populus alba* we find in the following works: Lobelius, Stirp. Ob. p. 609, 1576; Matthiolus, Comm. Diosc. p. 136, 1565 and pp. 129, 130, 1598; Dodonaeus, Stirp. His. 823. f., 1583 and 835 f., 1616; Gerard. Herb. 1301. f. l., 1597.

In 1623, Caspar Bauhin distinguished two species of *Populus alba* (C. B. Pinax 429, 1623):

1. *Populus alba majoribus foliis.*
2. *Populus alba minoribus foliis.*

Under the first species Bauhin cites the above mentioned authors while under the latter he refers to the Icones of Lobelius.

In 1737, Linnaeus referred P. alba maj. fol., to his Populus foliis subrotundis dentato-angulatis: subtus tomentosis, while he brought the latter under the species as var. α. He gives the range of the species as follows: "Crescit in Germania, Hollandia, Anglia, Gallia, Italia. (Hort. Cliff. 460, 1737.) In Species Plantarum ed. 2. 1462, 1763, Linnaeus omitted var. α and no reference is made to *Populus alba min. fol.* of Bauhin.

Populus alba α of Haller (Stirp. Helv. 156. 1742.) is apparently the pre-Linnean *P. alba maj. fol.*

"*Varietas* α *qualem ad Rheni ripam in Alsatia reperi. foliis est hederaceis trilobatis. Pulchra arbor, foliis hinc cum atritate hirsutis. inde niveo tomento obsitis, facile adgnoscitur*" Haller l. c.

The species appears under the name of *Populus alba incana* in Weinmann's Inconographia p. 136. f. a. t. 826, 1745, and the figure is characteristic of *P. nivea.* In Miller's Gardener's Dict. ed. 8, it appears under the name of *Populus major* and in Aiton's Hortus Kewensis 3:405, 1789, as *P. alba* β *nivea.* It reappears in Willdenow's Berlin, Baumz. 227, 1796, as *Populus nivea* while the name *P. alba* is applied to *P. canescens.* Willdenow describes his species *P. nivea* as follows:

"*Die Blätter stehen wechselsweise, sind gestielt, länglich rund, dreilappig, an der Basis zuweilen mit kleinen Lappen versehen. Die Seitenlappen sind ausgebreitet, endigen sich in einer runden, bisweilen etwas verdünnten Spitze. Die mittlere Lappen ist sehr lang vorgezogen, stumpf zugespitzt, am Rande undeutlich gezähnt, auf der Oberfläche sehr dunkelgrün und glänzend, auf der Unterseite schön blendend weise, mit einem diken Filz überzogen. Der Blattstiel ist rund und weissfilzig.*" "*Die Blätter lassen sich von der ersten Art* [Populus alba Ait. non. L.] *durch die drei tiefen Lappen, und dass blendende Weiss der Unterfläche beim ersten Anblik unterscheiden.*" Willd. Berl. Baumz. 227, 1796.

Willdenow apparently adopted the view held by Aiton. After J. E. Smith had published *P. canescens* (Fl. Brit. 3: 1080, 1804.) Willdenow returned to the pre-Linnean concept of *P. alba*, giving

as synonyms *P. alba majoribus foliis*, Bauh. Pin. 429, *P. alba* Dod. Pemp. 835. *P. alba latifolia* Lob. Ic. 2. p. 193, etc. Under *P. canescens* (Willd. Sp. Pl. 4: 802, 1805) he cites the second species of Bauhin, *P. alba folio minore.*

From the above it is clear that the *Populus alba* of pre-Linnean and later authors is identical with *P. nivea* Willd.—possibly the handsomest of poplars. The illustration in Flora Danica (t. 2182) does not show the very characteristic leaves of the upper branches and the rootshoots.

According to Carl Hartman (Anteck. Linn. Herb. 423) there appears to be one specimen of *P. alba* in the Linnean Herbarium. That this specimen represents the historic species we may conclude since Hartman cites *P. nivea* Willd., as a synonym of *P. alba* L. (See Skadin. Fl. ed. 10. 187, 1870.) The synonymy of *Populus alba* so far as we have been able to ascertain is:

Populus alba Matth. Comm. Diosc. 136, 1565, Dodon, Stirp. Hist. 823, f., 1583; Camer. Epit. 65, 1586; Tabern, Kräut, 3: 72. 1591; Jonst. Dendr. 437. t. 123. f., 1662; L. Hort. Clif. 460, 1737; Sp. Pl. 1034, 1753; Willd. Sp. Pl. 4: 802. 1805. Reichenb. Icones Fl. Ger. 11: 29. t. 614. 1849.

Populus alba latifolia Lob. Icon. 2: 193, 1581.

Populus alba majoribus foliis C. Bauh. Pin. 429, 1623.

Populus alba α Haller, Stirp. Helv. 156, 1742.

Populus alba incana Weinm. Iconogr. 136. t. 826. f. a. 1745.

Populus major Mill. Gard. Dict. ed. 8. 1768.

Populus alba β *nivea* Ait. Hort. Kew. 3: 405. 1789.
Wesm.: D. C. Prodr. 16: 324. 1868.

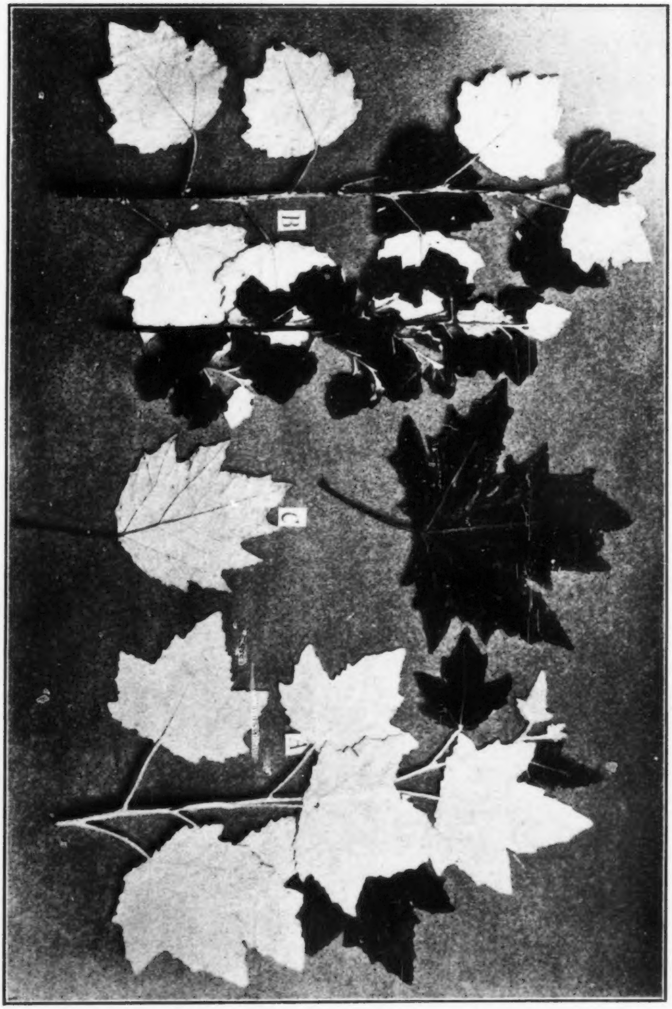
Populus nivea Willd. Berl. Baumz. 227, 1796.

Description: "*Rami horizontales. Fol. subrotundo-ovata, angulato-dentata, ramulorum terminalium multo maiora, cordata, palmato-5-7-loba, dentata, omnia sicut ramuli petiolique albissima. Amenta ovata, squamae apice fissae, ciliatær.*" Schmitz & Regel. Fl. Bonn. 150, 1841.

This handsome tree is readily recognized by its horizontal branches, its light gray bark and angular leaves. While in *P. canescens* the bark has a greenish-gray tinge. In *P. alba* there is scarcely a trace of yellow or green. When allowed to spread the lower branches are horizontal and the tree is broader than high. The leaves of the rootshoots and the uppermost branches are

(From Lobelius, Icones, 1581)

PLATE VI. TIDESTROM on POPULUS.



B. P. canescens C. P. alba Bolleana A. P. alba

PLATE VII. TIDESTROM on POPULUS.

characteristic of this species: they are dark green above and densely white tomentose beneath, cordate or truncate, obscurely 5-parted,—three lobes prominent, and the two basal lobes small, unequally serrate, 8-10 cm. or longer, and somewhat broader. The normal leaves are smaller, ovate, cordate, cordate-angular or rotund, 4-6 cm. long and somewhat narrower, white tomentose when young, canescent in age. Branchlets and buds more or less white tomentose. Pistillate catkins 5-8 cm. in length; flowers crowded, olive colored, style very short: stigmata filiform, lobed. I have not observed any male trees in America. The species is found in cultivation in the Mormon settlements in Utah and Idaho. There are several trees about an abandoned nursery near Washington, D.C.

Populus alba as we understand it, is a strikingly handsome tree. The clear gray bark of trunk and branches, the dark green upper and the "snow white" nether face of the leaves produce an effect which no other poplar can do, with the exception perhaps of our American Quaking Aspen after a frost.

II. POPULUS CANESCENS.

This species has been referred to above. That it was embraced in the earlier concept of *P. alba* there is little room for doubt as there are more characters in common between *P. alba* and *P. canescens* than between the latter and *P. tremula*. *P. canescens* appears to occupy a mean position between *P. alba* and *P. tremula*, and although its claim to specific rank has been disputed by many its different aspect would entitle it to be classed as a species. It is difficult to distinguish the normal leaves of *P. canescens* from those of *P. alba* as they vary very much in both species both as to form as well as to pubescence. The leaves of the rootshoots in *P. canescens* vary from cordate-ovate and somewhat 5-lobed to nearly orbicular with variously indented margins,—crenate to irregularly dentate. The branchlets are sometimes canescent but usually glabrous and of a rich chestnut color.

As noted above the uppermost branches and rootshoots in *P. alba* bear the large 3-lobed, tomentose leaves so characteristic of the species. In *P. canescens*, on the other hand, the large abnormal leaves are found principally on the rootshoots, if my observations prove correct. The principal synonyms of this plant are:

Populus alba minoribus foliis Lobel. Icon. 2:193. 1581. C. Bauh. Pin. 429. 1623. Weinm. Iconogr. 136. t. 826. f. B. 1745.

Populus foliis subrotundis, etc. var. υ Linn. Hort. Cliff. 460. 1737.

Populus alba β Haller. Stirp. Helv. 156, 1742.

Populus alba α *canescens* Ait. Hort. Kew. 3: 405. 1789.

Populus alba Willd. Berl. Baumz, 227. 1796.

Populus canescens J. E. Sm., Fl. Br. 3: 1080, 1804. Engl. Bot. t. 1619. Willd. Sp. Pl. 4: 802, 1805. Reichenb Icones Fl. Germ. 11: 30, t. 617, 1849.

Populus albo-tremula Krause, Jahrb. Schles. Gesell. 130, 1848; Wesm. in D. C. Prodr. 16: 2 pt. 325, 1858.

The gray Poplar is found extensively in cultivation: it is readily recognized by its greenish gray bark and thick branches. The latter usually stand at an angle of 60° more or less from a vertical line. In this respect *P. canescens* differs much from the true white Poplar.

III. POPULUS ALBA BOLLEANA.

Populus alba var. Bolleana. Masters, Gard. Chron. 18:556. f. 96, 1882.

This form is found occasionally in cultivation. I have observed several trees about Washington, D. C. where Dr. E. L. Greene called my attention to them. The color of the bark of trunk and branches approach nearly that of *P. alba.* The normal leaves are ovate-acute, 5-8 cm. in length, irregularly dentate or sometimes lobed; the leaves of the rootshoots are much larger than in the true *P. alba.* These leaves are fully 1 dm. in length and somewhat broader; the five primary lobes are variously toothed, incised or lobed.

Washington, D. C.

Bird Notes.

WALTER L. HAHN.

The following notes have no relation to one another and, in themselves, may be of little value to science. A large number of observations on the changes taking place in our fauna would, however, form a basis for important biological deductions.

No such mass of data exists, party because the observations have not been made on a large scale, but principally because there has been no

ready means of recording them. We are far behind the British people in number of journals of a local nature devoted to natural history, and the writer believes that the *Midland Naturalist* has an important mission to fulfill in serving as a medium for the publication of notes of local interest as well as in the articles of broader scope.

THE RED-SHAFTED FLICKER IN EASTERN SOUTH DAKOTA.

The red-shafted flicker is a resident of the plateau region of western North America, its range extending east to the Black Hills. It was observed October 3, 1909, by Prof. M. F. Hoopes, of the Springfield State Normal School, and the writer about one mile west of Springfield, South Dakota.

Two of the birds were seen flying from a fence to a wooded ravine a short distance away. They were in company with a number of golden-shafted flickers and the difference in color was very noticeable, as they were flying near the ground, in a good light, and at a short distance from the observers. Another flicker of this race was seen on the evening of October 5, flying over the campus of the Normal School. Means of securing the specimens were not at hand on either occasion but there can be no question as to their identity.

CHUCK-WILL'S-WIDOW AT MITCHELL, INDIANA.

Butler's Birds of Indiana says of the occurrence of this bird in the state, "Summer resident in lower Wabash Valley, at least as far north as Knox County. Breeds. In that region it is not uncommon." I know of no published record for any other locality in the state.

During the summer of 1907 one or more pairs of these birds were resident in the woods in the vicinity of University Farm, three miles east of Mitchell. Their characteristic song was heard by the writer nearly every evening during the late spring and early summer. The farmers of the vicinity also noticed it and commented upon its resemblance to the Whip-poor-will. They stated that they had never heard it previous to that year.

IS THE MOCKING BIRD EXTENDING ITS RANGE?

Several facts seem to indicate that the mocking bird (*Mimus polyglottos*) is extending its range and becoming more numerous in Southern Indiana. McAtee* states that it was rare at Bloomington from 1882-1886 and common from 1901-1903. The earliest date on which it was seen during the latter period was March 24, 1901.

The writer also observed the species at Bloomington from 1901-1903 and again in 1908 and believes that it was more abundant during the latter year. Certainly it has extended the period of its yearly residence. Dr. Charles Zeleny, now of the University of Illinois, saw it and heard its song about the last of January, 1906, the exact record being lost.

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*Birds of the vicinity of the University of Indiana, Proc. Ind. Acad. Science, 1904, p. 157.

The writer identified it at this station February 19, 1908, and it became common that year before the end of March.

In southeastern Indiana this species has been recorded as a rare summer resident. I am unable to say positively whether it occurred on the farm where I lived during the decade ending with 1899, but it certainly was not common. It has increased in numbers steadily during the past six years or more and is now one of the most abundant, and certainly one of the most conspicuous birds of the vicinity. During a visit to the old farm in the latter part of June, 1909, mocking birds were seen in trees of ripening cherries more frequently than any other species. One pair was nesting in a grape arbor not more than ten yards from the door of the farm house and nearer than that to a much used walk. Another pair had a nest in the garden only a short distance from the first. Other nests were not located although there were more than two pairs of the birds in the immediate vicinity.

They were also seen at several places from one-half mile to three miles from the farm mentioned above.

A Boulder of Jasperite.

A. M. KIRSCH.

South Bend, Indiana, is a most interesting locality with reference to the glacial period in Geology. It is here that three great lobes of ice terminated, viz: the Lake Michigan Lobe, the Saginaw Lobe and the Erie Lobe; and for this reason, we find here rock material mingled from three very far removed localities.

The northern edge of the Erie Lobe piled up the moraines represented by the hills which run parallel with the St. Joseph River between South Bend and Mishawaka, and run almost in a straight line east and west. The material for this lobe was brought here from Ontario, Canada.

The Saginaw Lobe terminates north of the St. Joseph River, about two miles northeast of South Bend and one mile east of Notre Dame University. Its material was brought here from northeastern Michigan and vicinity.

The Lake Michigan Lobe piled up the hills lying to the west of the St. Joseph River. They may be seen best near Bertrand on the Indiana-Michigan line, some four miles northwest of Notre Dame; by remnants, these hills can be traced southwards as far as a point west of St. Mary's Academy, one mile west of the University.

Different kinds of soil may be found within a radius of a few miles of Notre Dame; in the same gravel-pit even, there may be found boulders or pebbles brought here from the north, northeast or northwest, and commingling of this material has given to this locality a soil which is a puzzle to the uninitiated. The flora and in particular the plant species

are largely determined by the soil on which they grow. Those species which we find here had a mighty struggle in adapting themselves to such strained conditions. It is no wonder, therefore, that the experienced botanist finds this locality full of contradictions. The fact is, our flora is not as yet completely adjusted to the soil. Dr. Edward L. Greene, a most experienced field botanist, spent three weeks here last May (1909), to solve some of the puzzles of the northern Indiana flora. He made some very interesting discoveries which he will, no doubt report in due time.

If I may be permitted a few personal observations in this matter, I may state that for twenty-five years during which I conducted classes of botany, most of the time, I had to offer explanations for the discrepancies in the descriptions of the species in Gray's Manual. Most of the species did not harmonize with the descriptions in the manual. A boulder of Jasperite, found here some years ago, explains to some extent the cause of this confusion. It was found here in Northern Indiana commingled with

material brought here from an entirely different region.

Jasperite is only obtained in Lake Superior region, and this piece from Indiana commingled with material from Ontario, Canada and from Michigan is a clue to the complex soil of northwestern Indiana.

Louis V. Pirsson, "Rocks and Minerals," Pp. 396, defines Jasperite as "a name given to....rocks which consist of layers of red chert (jasper) and hematite. They occur in the Lake Superior region. See page 297." And then he continues: "Jasper is a chemically precipitated opaline silica. In places, as in the Lake Superior region, the jaspers are strongly ferrugineous and interlaminated with bands of hematite. They constitute rock-masses of considerable size, affording valuable deposits of iron ore. They are called Jasperite. The cherty (jasper) layers are colored bright red by the iron oxide." From the accompanying illustration, the difference between the two layers will be easily seen. We add here some of the physical properties of the specimen.

Size. The specimen is 24.1 centimeters long and 12 centimeters wide, with a circumference of 61 centimeters in the length and 42 centimeters in the breadth.

Shape. As seen from the illustration it is approximately oval, resembling somewhat an exaggerated oval pebble.

Hardness. Jasper has a hardness of 7. and Hematite one of 6., average 6.5.

Weight. In air it weighs 6 kilos and in water 4.4 kilos; hence its specific gravity is 3.75.

Erosion. The rounded form and absence of sharp corners shows that our specimen was transported from a distance; and this distance must have been considerable judging from the hardness of the rock. As this particular kind of rock is found only in its native locality about Lake Superior; and this specimen was found in northern Indiana, the obvious conclusion is that it was transported to the latter place by some agent. The natural transporting agents are air, water and ice. It must have been brought here by ice during the glacial period. Its present size and rounded shape resulted from erosion during the period of transportation. The absolute volume and shape may be inferred from its present condition; it evidently depends on its original size and shape, the distance it has travelled, the time of its journey, the material it encountered in its transit, and finally on the weathering it has undergone.

Weathering. The weathering, and especially the differential weathering is very apparent. The hard jasper stands out in well defined ridges, whilst the softer hematite is marked by deepened furrows. If we knew the relative amount of weathering of jasper and hematite in terms of time, we could calculate approximately the absolute time consumed in the weathering of this specimen. The difference between the ridges of jasper and furrows of hematite would form the basis for the calculation.

Original size. Judging from the hardness of the two minerals, we would infer that the original size of the specimen was not much greater than it is at present. Its companion mineral also much softer during its period of transportation and, therefore, could not reduce the specimen very much by friction and wear.

Average composition. The specific gravity of our specimen of Jasperite is 3.75, hematite has a specific gravity of 5.2 and jasper one of 2.6. Knowing these, we deduce the specific gravity for jasperite in the following manner. Adding the specific gravities of jasper and hematite and dividing by two we get the mean specific gravity for equal proportions. Now if we add 5.2 and 2.6, we get 7.8 and dividing this by two, we have 3.70, which is the specific gravity of jasper and hematite mixed in equal proportions. The specific gravity of our specimen is 3.75 and this minus 3.70 gives us a difference of only 0.05. This shows that our specimen is approximately a mixture of equal portions of jasper and hematite, with a slight increase of the hematite.

I shall add here a few notes on the two minerals of jasper and hematite. Jasper is a variety of quartz and is always amorphous, i. e., never

appearing in crystal forms as is very common with quartz or silica ($SiO2$). It also contains some iron sexquioxide ($Fe2 O3$) and vary frequently some clay, hence its hardness is slightly below that of pure quartz. Jasper is mostly yellow, but it is often found, as in our specimen, of a rich deep red color. This color, so emphatic in our specimen, is caused by heat and the presence of iron—the iron becoming anhydrous and causing the change in color. We learn, therefore, that molten hematite introduced into a quartzose rock, very likely a pure sandstone, and caused the silica to turn into red jasper.

Hematite, from the Greek *Haima*, meaning blood, is so named on account of the red color which this mineral presents especially when scratched. It is commonly called red oxide of iron ($Fe_2\,O_3$) in distinction from other common iron ores such as magnitie ($Fe_2\,O_4$) and limonite ($2Fe_2\,O_3\,3H_2\,O$) which latter is often called brown oxide. From the formula of limonite it is seen that hematite is derived by dehydration which, as explained above, is caused by heat. A limonite clay mixed with sand or pure quartz will, therefore, turn into jasperite by the application of heat, and this is very likely the genesis of the jasperite of the Lake Superior region.

We may gather many interesting facts of the glacial geology of Northwestern Indiana from this piece of jasperite which explains some of the features of local geography and glacial geology.

Birds Found in Van Buren Co., Mich., from July 4 to August 13, 1909.

Brother Alphonsus, C. S. C.

July is the month when summer residents among the birds may be seen to best advantage. Most of the young birds are fledged and, with the old ones, form families, which feed together. Birds that have more than one brood are still in song and are, of course, conspicuous on that account. The song season for a number of species, such as the Warbling and Red-Eyed Vireos, Towhee, Scarlet Tanager, Indigo Bird, Song and Field Sparrows, lasts almost through the summer.

In this county the writer saw all but one of the ten species not seen by him in June in St. Joseph Co., Ind. The Rose-breasted Grosbeak was not seen here. The large lakes and swampy land around them, in Van Buren County, enabled the writer to find most of these birds. Seven species seen in St. Joseph County in June were not found here in July. These are: Bobolink, Cowbird, House Wren, Nighthawk, Swamp Sparrow, Loggerhead Shrike and Redstart.

It is interesting to note that a short distance from Bankson Lake, near Lawton, Mich., certain species of birds may be found which are not

residents at the lake. This is due to a difference in the character of the country. Ten miles north, in an immense tract of woodland, the Pilated Woodpecker is seen; while about five miles east, in rich prairie land, the Golden Plover is fairly common.

BIRDS SEEN EVERY DAY.

Red-headed Woodpecker	Chipping Sparrow
Wood Pewee	Song Sparrow
Warbling Vireo	Robin

BIRDS SEEN ON EVERY DAY EXCEPT THE DATES AFTER THEIR NAMES.

Yellow-billed Cuckoo 12, 16, 21, 22, 23, 28, 29. Aug. 2, 4, 7, 9.
Kingbird 13.
Crow 5, 16, 21.
Baltimore Oriole 8, 10, 18, 19, 29.
Purple Grackle 5. Aug. 4, 6, 12, 13.
Field Sparrow, Aug. 11.
Indigo Bird 12, 16.
Barn Swallow 20, 21, 26, 28, 29, 30. Aug. 2, 5.
Brown Thrasher 7, 13, 15, 16, 18, 23, 25, 30. Aug. 2, 6, 7.
Killdeer 26, 28. Aug. 4, 5, 10, 11, 13.
Yellow-legs 10, 11, 17, 22, 23.
Spotted Sandpiper 9, 13, 18, 19, 23, 24, 25, 27, 28, 29. Aug. 1, 6, 10, 12, 13.
Mourning Dove 4 to 11, 14 to 18, 21, 22. Aug. 2, 6, 11.
Yellow Warbler 11, 14, 19, 21, 22, 23, 28, 29, 31. Aug. 1 to 7, 9, 13.
Belted Kingfisher 5, 9.
Flicker 8, 13. Aug. 1, 11.
Phoebe 4, 5, 6, 12. Aug. 3, 11, 13.
Red-winged Blackbird 11, 29. Aug. 4, 6, 13.
Goldfinch 15.
Vesper Sparrow 15, 21, 23. Aug. 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13.
Maryland Yellowthroat 16.
Catbird 8, 12.
White-breasted Nuthatch 19.
Bluebird 5, 9, 11, 13.
Downy Woodpecker 4, 5, 7, 8, 9, 12, 23, 24, 28. Aug. 7.
Yellow-throated Vireo 4, 5, 19, 21, 22, 23, 25, 27. Aug. 6, 7, 8, 9, 10, 11, 12, 13.
Alder Flycatcher 9, 13, 14, 19, 21, 22, 26, 27. Aug. 12.
Blue Jay 11, 19, 20, 23 to 26, 30. Aug. 4, 5, 6, 8, 10 to 13.

BIRDS SEEN ON DATES AFTER THEIR NAMES.

Screech Owl 14, 15, 25, 26, 27, 30, 31. Aug. 6.
Hairy Woodpecker 4, 11, 12, 15, 17, 27. Aug. 7, 10, 12.
Chimney Swift 19, 23.
Hummingbird 11, 16, 19, 24, 27.
Meadowlark 14, 19.
Dickcissel 5, 6, 7, 9 to 12, 14, 18.
Scarlet Tanager 4, 5, 7, 14, 15, 19, 20 24, 27, 29, 31. Aug. 1, 4, 6.
Red-eyed Vireo 4, 5, 7, 12, 13, 14, 20, 24.
Chickadee 7, 13, 14, 17, 20, 24 to 28, 31. Aug. 2, 12.
Chicken Hawk 24.
Cardinal 14.
Black-billed Cuckoo 13, young bird.
Whip-poor-will 4, 6, 14, 15, 16, 19, 22, 25, 30. Aug. 1, 2, 4, 5, 8, 9.
Crested Flycatcher 8.
Orchard Oriole 4, 11.
Towhee 4, 7, 9, 12, 13, 14, 17, 19, 20, 25, 31. Aug. 2, 4, 5, 6, 9, 12.
Cedarbird 4, 8, 23. Aug. 6, 8, 10.
Long-billed Marsh Wren 13, 16, 18, 19, 20. Aug. 2, 3.
Bittern 8, 14, 16, 20, 22, 28, 31.
Purple Martin 17, 19.

Bobwhite 12, 13, 15, 18, 20, 27, 29, 30, 31. Aug. 3, 6, 7.
Eave Swallow 20.
Tree Swallow 23 to 26.
Hell Diver 15. Aug. 13.
Loon 5, 16, 19, 25.
Bank Swallow 9, 10, 13, 14.

NUMBER OF SPECIES SEEN EACH DAY.

July 4, 37.	July 25, 36.
" 5, 30.	" 26, 35.
" 6, 33.	" 27, 36.
" 7, 36.	" 28, 30.
" 8, 32.	" 29, 30.
" 9, 32.	" 30, 34.
" 10, 31.	" 31, 38.
" 11, 31.	Aug. 1, 29.
" 12, 34.	" 2, 33.
" 13, 35.	" 3, 32.
" 14, 42.	" 4, 30.
" 15, 36.	" 5, 31.
" 16, 33.	" 6, 29.
" 17, 36.	" 7, 30.
" 18, 31.	" 8, 33.
" 19, 35.	" 9, 32.
" 20, 40.	" 10, 32.
" 21, 26.	" 11, 26.
" 22, 28.	" 12, 31.
" 23, 27.	" 13, 23.
" 24, 38.	

Total number of species seen, 60.

Notes on the Stemless Lady's Slipper.

EDWARD L. GREENE.

Of these notes, however, I am but the editor, not the author, as will readily be seen. The paper which appeared in the August issue of the NATURALIST called forth from a number of botanical friends and correspondents so much additional information, showing still further diversity in the habitat of *Cypripedium acaule*, that no reader interested in the plant will question the desirability of their being given publicity.

Mr. Charles C. Deam, a zealous Indiana botanist, until lately of Bluffton in the northeastern part of the state, now of Indianapolis, under date of September 5th, writes: "Your article on *Cypripedium acaule* was interesting. I have taken this species in Steuben County, Indiana, from the border of a lake in a tamarack

swamp. It grew as you described it in tamarack conditions, and was fairly abundant. I took perhaps thirty sheets of specimens at this place. One or two of them had two flowers, but I think two-flowered specimens are rather rare."

Not having before heard of such a thing as a two-flowered plant of this species, I wrote to Mr. Deam at once to inquire as to how they were two-flowered; whether with the two flowers on two separate scapes, or, on one two-flowered scape. My correspondent wrote later that he had tried to find his two-flowered specimens and could not; and he was manifestly unwilling to venture a reply to my query without a new look at the plants. Here, then, there is something for future collectors of the plants to look into.

Professor C. F. Wheeler, now of the Department of Agriculture in Washington, but for a quarter-century, more or less, an active Michigan botanist, long time Professor of Botany at the Michigan Agricultural College not far from Lansing, I find very familiar with our Stemless Lady's Slipper as it occurs in the tamarack marshes of south-central Michigan. He informs me that its habitat and associations in that region are quite those which, in my former paper. I attribute to it as a denizen of tamarack marshes of the opposite side of Lake Michigan in southern Wisconsin, though with the rather noteworthy difference, that he often gathered it in his Michigan region growing in the very midst of the living sphagnum itself, where, as the plants were lifted, their white roots showed plainly that they had not been in any soil at all, but were supported by the watery-spongy sphagnum. I may here remark that in the larch swamps of Wisconsin, it was in this watery-spongy sphagnum alone that *Arethusa* and *Pogonia* grew but not the *Cyprepidium*.

For a good account of some new phases of this plant's ecology I am indebted to two other Michigan botanists, both of them, if I mistake not, former students of Prof. Wheeler.

Mr. H. C. Skeels gives me the following: "*Cypripedium acaule* Aiton, at Grand Rapids, Kent County, Michigan, grows in the dense sphagnum of the tamarack-spruce-cedar swamps; here usually attaining the height of from 12 to 18 inches. It is also found, but not as plentifully, at Mill Creek in the same county, on the summits of sandy ridges, under pine and hardwood trees; about 6 to 10 inches high. In sphagnum pockets at the base of these ridges the tall form is found."

The two most interesting points in Mr. Skeels' account are—first, that at the Mill Creek station that he writes of, the species occurs in two very different conditions, yet in close proximity to each other; for it is a sphagnum bog plant along the base of a chain of hills, and a sandy woods plant a few rods away along the summits of these hills. The second point of deep interest is, that it is here a sand dune plant. The Grand Rapids and Mill Creek region where Mr. Skeels made these ecologic studies, though many miles away from what is the present shore of Lake Michigan is but an ancient beach of the same lake. The ridges on top of which the Lady's Slipper grows are but old sand dunes of the ancient shore, now overgrown with the forest. This Mr. Skeels understands as perfectly as I. He also comprehends as clearly that what he lucidly calls the sphagnum pockets down at the base of the old sand dunes were water pools anciently, until the sphagnum came in and claimed possession. He also assures me that swamp huckleberries grow in the sphagnum pockets quite plentifully, and black huckleberries are a part of the underbrush amid which the plant thrives at the summit. The fact that the plant of sandy ridges is only about half the height of that of the boggy places below is well worthy of remark.

A recent letter from Mr. Charles K. Dodge of Port Huron, Michigan, in which he acknowledges the receipt of my former notes on the species, and also refers to my last spring's visit to Port Huron, says: "I wish you had mentioned to me the *Cypripedium acaule*. It is a sand dune plant in Huron County, Michigan, growing in abundance in shade, between sand ridges, up and down their sides, and all over them; but always in the shade of small trees and bushes. About Port Huron, and across the St. Clair River in Lambton County, Ontario, it is only occasionally found, and in ground that is wet in spring and autumn, but apt to be dry in midsummer. I have never met with it in swamps as stated in books."

On this exceedingly instructive and interesting piece of information I need but remark that Mr. Dodge has for his field the most easterly part of southern Michigan, where the sand dunes are those of Lake Huron; and they are not the dunes of many ages since, but rather recent and close by the lake itself. His west Canadian habitat for it in Ontario, is a part of the same Lake Huron shore district.

Nyssa sylvatica Marsh.

THEO. HOLM.

[*With 16 figures drawn by the author.*]

The genus *Nyssa* is now confined to North America (southern Ontario and the eastern United States), where three species are distinguished, and to southern Asia, where a single species is distributed from the eastern Himalayas to the island of Java. *Nyssa sylvatica* Marsh, *N. Ogeche* Marsh, and *N. aquatica* L. are the American species, familiarly known as Tupelo, Pepperidge, Black or Sour Gum. They are deciduous trees with unisexual flowers, and alternate leaves, and very distinct from *Cornus* and *Garrya*, the only other members of the *Cornaceæ* represented in our country.

While excellent illustrations and very detailed descriptions of these *Nyssae* are to be found in Sargent's Silva of North America there are still some points of interest to be noticed, which have not, so far, been recorded, and which may deserve attention. A comparative study of the three American species would, of course, lead to better results than the consideration of only one of these, but since *N. sylvatica* is the only species occuring in this vicinity, I am compelled to confine myself to this species, hoping that the present notes may serve as a small contribution to the knowledge of this, in many respects, very peculiar tree.

Characteristic of the mature tree is the frequently very broad and flat top, the crowded horizontal to pendulous branches, and the very short, stout, lateral branchlets, not speaking of the bright, crimson color of the foliage in Autumn. The leaves are generally described as entire, in contrast with the frequently remotely and irregularly angulate-toothed ones of *Nyssa aquatica*. Sargent (l. c.), however, states that they are "rarely coarsely dentate", while Bentham and Hooker describe them as "integerrima or juniora lobato-dentata." Of these statements the latter is the more correct.

In studying the foliage of trees, which in many of our native species offers a multitude of forms, especially in regard to outline, it is necessary to include the younger stages, and if possible, the seedlings. Not only is the manner of germinating of some interest, but also the structure and shape of the first leaves succeeding the cotyledons, since these, the so-called primary leaves, evidently repre-

sent the foliage of ancestral types, a point that has been discussed and explained in *Quercus*, for instance.

Now in regard to the *Cornaceae*, *Aucuba japonica* is the only one of which the seedling-stage has been described by Lubbock in his comprehensive work on seedlings, and none are mentioned by Klebs.* In the seedling of *Aucuba* the primary root is stout and fleshy; the hypocotyl is quite long, and the cotyledons oblong-ovate, obtuse, three or five-nerved, shortly petiolate. The first pair of leaves are ovate, while the second and third pairs are reduced to small, subulate scales preceding the ultimate, which are ample, lanceolate-oblong, distinctly serrate-dentate on the upper half, and alternately penni-nerved. In *Cornus florida*† the primary root is rather slender, the hypocotyl erect, and the cotyledons green and foliaceous; the primary leaves resemble those of the mature tree, but are, however, held in a vertical position, and are somewhat narrower than the typical leaves. A very similar structure is represented by the seedling of *Nyssa*, or to be more exact of *N. sylvatica*, since the seedlings of the other species are not known so far. In this species of *Nyssa* (Fig. 1.) the primary root (R) is long, very slender and amply ramified, especially at the base, beneath the hypocotyl (H). This organ, the hypocotyl, is erect, but slender and bears two green, oblong cotyledons, which are obtuse, and approximately five-nerved; (Fig. 2.) the following internodes are stretched, and the leaves of the first season vary from elliptic with entire margins to obovate with the margins dentate. The foliage of the seedling, thus, differs in a marked degree from that of the mature tree, which we remember is mostly oval or obovate, and always with the margins entire. In the second season we meet with a single, erect shoot with remote leaves and with the primary root developed as a strong, very long, deep root; we observed at this stage the same variation in foliage, as a matter of fact it recurs for several years so long as the plant is a mere shrub, but ceases when it becomes a tree. In other words the dentate leaves characteristic of *N. aquatica* occur, also, in *N. sylvatica* before it reaches maturity. It would be interesting to know whether this be the same case of *N. Ogeche*, of which only the entire leaf is recorded.

This peculiar variation in regard to the foliage, with the margins entire or dentate, does not depend upon the position of the

* Untersuchungen aus d. bot. Inst. Tuebingen I: 536. 1881–1885.

† Merck's Report for Dec. 1909.

leaves, and is almost as striking as the well-known heterophylly in *Sassafras*, where lobed and entire leaves appear on the same shoot with no indication of any special arrangement. So far as concerns our *Nyssa* I can only say that the dentate leaves occur occasionally on the seedlings during the first season, that they are very frequent on the young shrubs, where they are equally as common on the long, vigorous shoots as on the short, lateral branches of these; but, so far, I have not observed any such dentation of the leaves on the root-shoots of *Nyssa*. The accompanying figures 3–6 illustrate the foliage of a single lateral branch, of which figure 3 shows the basal, figure 6 the apical of these leaves; figure 7 represents a larger leaf from a tall shrub, and the dentation is very pronounced. It generally appears as if the dentate leaves are larger than the entire; it is, for instance, not uncommon to find dentate leaves measuring up to fifteen cm in length, while the entire on the same branch may reach only nine or ten cm, or much less. Another point, not to be left out of consideration, is the noticeable difference in outline between these two types of leaves. While the dentate are always obovate, the entire vary from lanceolate to oval, obovate, the oval being perhaps the most frequent of the mature tree, and the obovate that of the seedling.

In passing to describe the internal structure of the vegetative organs as observed in *Nyssa sylvatica*, it must be stated beforehand that the stem and leaves of the *Cornaceae* have already been studied by various authors, while the root, as is generally the case, has been neglected. A very complete treatment of the family from an anatomical point of view has been presented by Solereder in his work, *Systematische Anatomie der Dicotyledonen*.* In this treatment, however, the leaf and the stem of the mature tree only have been examined, thus we conceive no comparison between the various stages of growth, and no information about the root-structure. The ample material which I have had the opportunity to study enables me to present some supplementary notes, beside a description of the root-system as represented in the seedling and mature tree. Let us begin with the root.

THE ROOT.

So long as the cotyledons are the only leaves developed upon the seedling the primary root shows a very simple structure, and

* Stuttgart 1899 page 487.

with no indication of increase in thickness. At this stage it is unbranched, and very little hairy. The only peculiarity, which may deserve mention, consists in the presence of a broad pith. Beside that the hadromatic rays are very short and separated by broad arches of leptome; otherwise the structure is very simple. The cortex is homogeneous, there being no exodermis and no stereïds, but about ten strata of thinwalled parenchyma, very compact, and with no deposits of starch. Endodermis is, also thinwalled with the Casparyan spots plainly visible, and the pericambium is continuous represented by a single layer; the stele is tetrarch. Later on when the seedling is at the stage shown in the accompanying figure 1, the root has commenced to branch, and has increased considerably in length. At this stage the internal structure is changed, and to such an extent that the pith and the primordial vessels are the only tissues left intact. Epidermis is now partly thrown off, nearly the whole cortex is collapsed so as to form wide cavities, and the thickened endodermis shows here and there radial divisions. Inside endodermis we notice a broad secondary cortex, developed from the pericambium surrounding a solid stele of collateral mestome-strands and a central pith, at the periphery of which the four primordial hadrome-rays are still to be recognized. Starch was observed in the narrow (one row) medullary rays, but no crystals of calcium oxalate. In regard to the lateral roots, borne upon the primary, the structure agrees with that of the mother-root before the secondary formations set in; these are, however, also capable of increasing in thickness, but much later than the primary.

A still more modified structure occurs in the thick, woody roots of the mature tree. In these all the primary tissues from epidermis to endodermis incl. are lost, but replaced by a heavy coating of homogeneous, thickwalled cork of pericambial origin, which encloses a broad secondary cortex with aggregated crystals of calcium oxalate, deposits of starch, and interspersed with groups of thickwalled, porous sclereïds. The stele is very broad, with numerous wide tracheids, thickwalled parenchyma and libriform; the medullary rays are thinwalled, and consist mostly of a single or two rows of radially stretched cells, containing starch.

While thus the root of our *Nyssa* illustrates the general structure of the dicotyledonous type so far as concerns the primary and secondary stages, the presence of crystals and sclereïds in the secondary cortex is of some interest.

THE STEM.

The hypocotyl, the first internodes of the seedling, the branches of the mature tree, and finally the peduncle of the female inflorescence, these represent portions of the stem of which the structure must be considered in order to obtain a complete view of the internal morphology of this organ. To ascertain the primary structure of the stele the hypocotyl is especially instructive, while the older branches of the tree show us the tissues in their final shape with the secondary formations. In regard to the origin of the secondary mestome-strands, we remember that these most frequently develop from interfascicular cambium, or from a procambium*; however, several and very distinct modifications are known, more so from herbaceous than from woody stems, and some of these structures may be quite complicated. As regards the peripheral tissues these are, also, more or less involved and subject to change, when increase in thickness takes place, hence a comparison between young and mature shoots becomes necessary. In beginning with the hypocotyl of the seedling (Fig. 1), we notice at once that all the peripheral tissues are preserved although the stele shows already a marked increase so as to obscure its primary structure. Viewed in cross sections the stele represents a solid circular zone of leptome, cambium and hadrome enclosing a homogeneous, thinwalled pith, and this structure exists from the subterranean base to the apex beneath the cotyledons. In the basal portion it is very difficult to locate the primary mestome-strands, while toward the apex their position becomes readily noticeable by the presence of stereomatic strands in the pericycle, and by the primary vessels being more distinct, relatively narrow and of a darker color than the others. There are, thus, in all eight primary mestome-strands in the hypocotyl which traverse this parallel with each other and with the surface. But how these primary strands become connected with each other must be studied from a still younger stage than the one figured (Fig. 1.) We must examine the seedling before the cotyledons have ceased to grow, and before the plumule has developed into a shoot of several internodes. At this stage the stele shows very plainly eight primary collateral mestome-strands separated from each other by strata of thinwalled parenchyma (Fig. 8.); or at a

* Sachs: Lehrbuch der Botanik. Leipzig 1874 p. 113. Haberlandt: Physiol. Pflanzenanatomie. Leipzig 1896, p. 491.

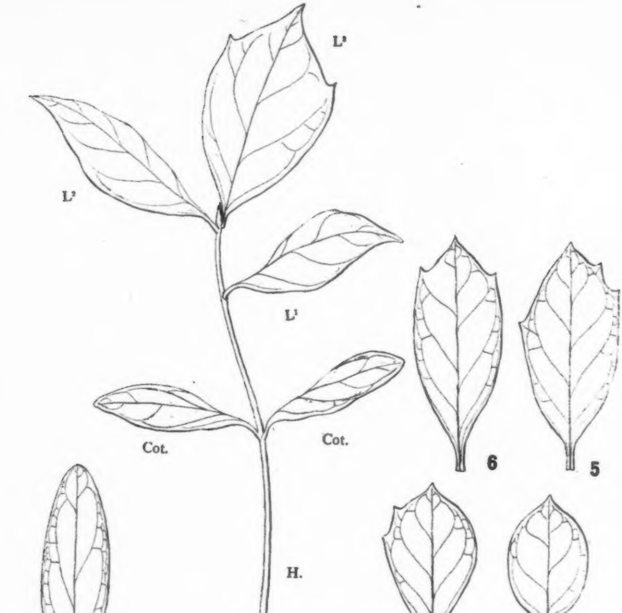

PLATE IX. HOLM on NYSSA SYLVATICA.

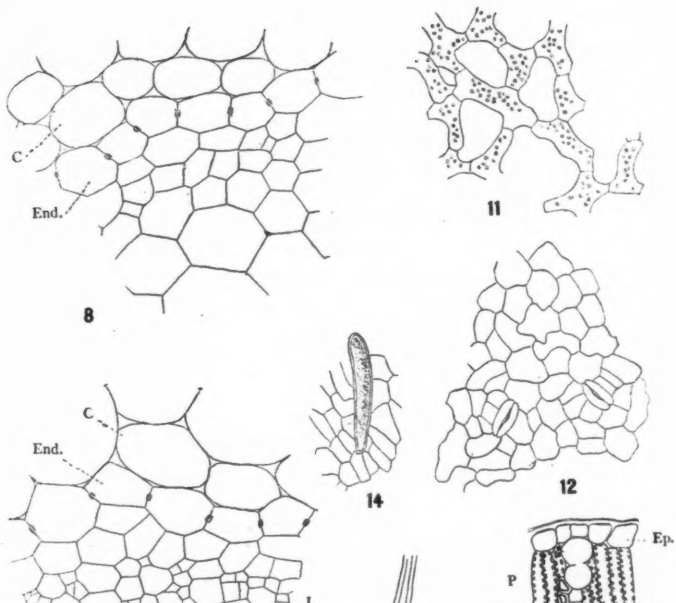

PLATE X. HOLM on NYSSA SYLVATICA.

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somewhat more advanced stage (Fig. 9.) we notice in this parenchyma a beginning development of leptome (L. in fig. 9.) beside tangential divisions, indicating the origin of an interfascicular cambium in direct connection with the primary intrafascicular. It is from the interfascicular cambium that the secondary leptome and hadrome become developed, rapidly increasing in thickness so as to equal the primary. In regard to the other tissues of the hypocotyl we might mention that near the base the cuticle is thin and smooth; covering a small-celled, thinwalled epidermis destitute of hairs. Furthermore that the cortex is homogenous, thinwalled, frequently collapsed, and that the hypodermal stratum shows a formation of cork. There is a distinct endodermis, thinwalled, but readily noticeable by the Casparyan spots, and inside this sheath is a thinwalled pericycle, which in the apical portion of the hypocotyl becomes stereomatic, but as already indicated only outside the primary leptome. Near the cotyledons the epidermis becomes thickwalled with the outer cell-wall extended into minute longitudinal crests, and the cortex is here solid, not collapsed. No crystals of calcium oxalate were observed in any parts of the hypocotyl. A somewhat modified structure occurs in the first internode of the same seedling (Fig. 1.) In this the cortical parenchyma consists of collenchyma near epidermis, while the internal strata are thinwalled and contain large, single crystals of calcium—oxalate, besides some aggregates of the same substance. There is no endodermis, but a pericycle of isolated strands of typical stereome surrounding the stele.

The seedling, thus, illustrates the primary structure and certain parts of the secondary, not only within the stele, but also near the periphery, when the cork has already made its appearance.

If we now examine branches of the mature tree, we meet with a much firmer structure; the cork represents here numerous and very thickwalled strata, covering a cortex which is collenchymatic throughout, and rich in chlorophyll; then follows the pericycle of thickwalled stereome intermixed with large, porous sclereïds, forming a closed sheath around the stele. In this the secondary hadrome contains scalariform vessels, porous tracheids with bordered pits, and much thickwalled libriform; the medullary rays are single with the cells stretched radially and filled with starch. The centre of the stele is occupied by a heterogeneous pith, starch-bearing and active in the periphery, but empty in the centre. A corresponding structure recurs in the peduncle, when the fruit is ripe. However,

the epidermis persists and is very thickwalled. There is no cork, and the cortex is collenchymatic throughout, the pericycle is very strongly developed with heavy layers of stereome and sclereïds, while the stele is narrow, surrounding a thickwalled, starch-bearing pith.

The mechanical tissues, collenchyma and stereome, are thus well represented in the stem of *Nyssa*, the former pertaining to cortex, the latter to the pericycle, or inside the hadrome as libriform. It is, also, of some interest to notice the superficial cork, and the occurrence of calcium oxalate as single or aggregated crystals in the cortical parenchyma.

THE LEAVES.

When cotyledons are aerial and foliaceous* they generally assume the same, or approximately the same structure as the leaves proper. They are mostly glabrous, however, and the chlorenchyma, sometimes, shows a less pronounced differentiation as palisade and pneumatic tissue, beside that the veins are frequently embedded and not projecting on the dorsal face. In speaking of *Nyssa sylvatica* the cotyledons do in some respects, possess a structure, which is rather distinct from that of the mature leaf of the tree, but not so much from that of the primary leaves, which I have drawn in figure 1 (L^1-L^3).

The principal distinction consists in the structure of the epidermis which, on both faces of the blade, exhibits undulate lateral cell-walls (Fig. 10), while in the leaves of the tree, these walls are nearly straight (Fig. 12); another distinction consists in the much larger size of both stomata and epidermal cells in the cotyledons, when compared with the mature leaves; this may be readily seen from the figures (Figs. 10 and 12) which are drawn to the same magnification. There are no hairs, and the leaf-structure is bifacial with a ventral palisade tissue, and a dorsal pneumatic. The midrib contains a single collateral mestome-strand surrounded by a thin-walled, barely stereomatic pericycle and a parenchyma of thinwalled cells destitute of chlorophyll; the secondary and tertiary veins are completely embedded in the chlorenchyma and provided with typical parenchyma-sheaths; no idioblasts and no crystals were observed in these leaves.

The short petiole is, also, somewhat different from that of the

* Merck's Report Dec, 1909.

mature leaves of the tree, since the mestome-strands (about seven) are arranged in a plane instead of in a stele. If we examine the primary leaves (L^1—L^3 in figure 1) we notice exactly the same structure of epidermis as to lumen and shape as described under the cotyledons. These primary leaves, however, are hairy, and the veins show the same simple structure as observed in the cotyledons. No crystals were found and no idioblasts either, although such occur in the petiole of the same shape as in the final leaves.

The foliar structure characteristic of the species is, however, the one possessed by the leaves of the mature tree. These are during the summer held in a horizontal position, and their structure is bifacial with stomata confined to the dorsal face, and with a ventral palisade-tissue. Very distinct cuticular striations are noticeable on both faces of the blade, but only the dorsal is hairy with small glandular (Fig. 14), and very long pointed hairs (Fig. 13), unicellular in both. The stomata (Fig. 12) have, sometimes, subsidiary cells parallel with the stoma, but are much smaller than those of the cotyledons and primary leaves. As already mentioned the lateral cell-walls of epidermis are nearly straight (Fig. 12), and the outer is thinwalled except beneath the midrib. The palisade cells represent a single layer, and are very high (Figs. 15 and 16), covering a few (about six) strata of irregularly branched cells constituting a pneumatic tissue with very wide intercellular spaces, which are especially noticeable in superficial sections (Fig. 11). We find in the chlorenchyma numerous idioblasts (Fig. 15), very thickwalled and porous representing the so-called sclereïds. These peculiar cells are known, furthermore, from species of *Garrya* and *Griselinia*, and they show translucent dots when the leaf is held towards the light. The midrib has a dorsal keel with hypodermal collenchyma and a large tissue of thinwalled, colorless parenchyma, but lacks endodermis; there is, on the other hand, a thickwalled stereomatic pericycle covering the leptome-side of the two separate mestome-strands which constitute the midrib. These two strands turn their leptome towards the surface of the blade, thus the hadrome is in the centre enclosing a small pith. Of these the dorsal strand is the larger; it is crescent-shaped (in cross-section) and contains leptome, cambium and relatively long rays of vessels. All the other veins are provided with distinct parenchyma-sheaths (P. S. in fig. 16) and are connected with both epidermes by strata of thin-walled parenchyma; they are frequently supported

by a little stereome on the hadrome-side. No crystals were observed in the blade of any of these leaves.

In regard to the petiole which often exhibits a structure characteristic of certain species, when examined just beneath the leaf-blade, we find in our *Nyssa* a large stele composed of six mestome-strands of the same structure as those in the midrib. A cross-section of the petiole shows a hemicylindric outline; epidermis is hairy and very thickwalled with wrinkled cuticle on the vertical face, and there are several, about six, hypodermal layers of thick-walled parenchyma with the stele. In this parenchyma large single and aggregated, globose crystals of calcium oxalate are quite abundant, beside some few idioblasts, very conspicuous by their enormous size and stellate shape. There is no endodermis, but a stereomatic pericycle on the leptome-side of all the mestome-strands. The selereïds, the peculiar, small glandular hairs and the mestome-strands being connected with epidermis, these characters together may be of taxonomic importance. In *Cornus florida* for instance * there are no glandular hairs, only long, bifurcate, and no sclereïds; furthermore the lateral veins are embedded in the chlorenchyma. But otherwise so far as concerns the internal structure the *Cornaceæ* offer no well marked characters by which we might distinguish the genera or the species; on the other hand we must admit that our knowledge of this particular part of the structure is, at present rather limited, not speaking of the root-system and the seedling-stage with the primary leaves. To the diagnosis of the species *N. sytvatica* should be added that the leaves of young specimens are frequently dentate like those of *N. aquatica* Marsh.

Fig. 1. Seedling of *Nyssa sylvatica* Marsh. R, the primary root; H, the hypocotyl; Cot., the two cotyledons; L^1, L^2 and L^3, the primary leaves; natural size.

Fig. 2. One of the cotyledons, showing the venation; natural size.

Fig. 3. Leaves of a shoot from a shrub; two thirds of the natural size.

Fig. 7. Leaf from a shrub, showing the dentate margin; two-thirds of the natural size.

Fig. 8. Cross section of hypocotyl; C, cortex; End., endodermis;x496.

Fig. 9. Cross section of hypocotyl; Camb, cambium; L., leptome; the other letters as above; x496.

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* Aerial, nonfoliaceous cotyledons exist, but are evidently very rare; they occur in Jatropha (Bot. Gazette 1899 p. 60).

Fig. 10. Dorsal epidermis with stomata of cotyledon;x320.

Fig. 11. Pneumatic tissue of same; x320.

Fig. 12. Dorsal epidermis with stomata of a leaf from a tree;x320.

Fig. 13. Base of a long, unicellular, pointed hair of same;x320.

Fig. 14. Glandular hair of same;x320.

Fig. 15. Cross-section of leaf from a tree, showing a large idioblast in the chlorenchyma; Ep.,* ventral, Ep., dorsal epidermis; x320.

Fig. 16. Cross-section of same leaf, showing a lateral vein with colorless parenchyma, stereome, and parenchyma-sheath, [P. S.); P, palisade tissue; the other letters as above; x320.

Brookland, D. C.

Book Notices.

A NEW HISTORY OF BOTANY

There is not yet extant in the English language any work, or even the beginnings of any work, that is of the nature of a history of botany from the earliest times down to the present. For such history of botany in general as we have we are indebted to the zeal and learning of Frenchmen and Germans of the eighteenth century and the early nineteenth; and these attempts are partly in French, partly in German, and the best of them are in Latin.

There is now in the press in this country, and under the auspices of the Smithsonian Institution at Washington, the first volume of a work in English bearing the title of *Landmarks of Botanical History;* an enterprise undertaken by Doctor Edward L. Greene, an Honorary Associate of the Institution.

The plan of this forthcoming work, as the title implies, is that of a careful study and plain elucidation of principal epochs in the development of the science from the earliest period. Such treatment of a subject as ancient as botany, having a literature so vast, and having undergone so many vicissitudes of advance and retrogression during more than two milleniums, can not by any possibility be reduced to the limits of a single volume, but must fill two or three at the least; and that which it is promised we soon shall see is but a first instalment, and not a very large one, of the *Landmarks;* but as replete with a great number, and much diversity of facts never before presented in any history of botany, that it fills

not much more than 300 pages will not, after due consideration, be thought a small instalment.

The more strictly historical chapters, of which there are eight or nine, are preceded by some 40 pages of an Introductory entitled Philosophy of Botanical History; a dissertation on how a history of botany ought to be written; enquiry as to several different lines along which progress ought to take place and should be recorded. Here the somewhat too restricted views of certain earlier historians are adverted to; restrictions due to less comprehensive notions as to what botany really is. Also in this Introductory it is shown that botany, even scientific botany, is so very ancient that its earliest beginnings are traceable to no book, but antedate all writing; that no plant name in any language is the name of an individual plant; that every such name unmistakably implies botanical classification; that these common terms in the speech of every people, plant names, are every one either generic, specific or varietal, not excluding family names, which also occur in the oldest known books that deal with plants. Thus, it is shown, is systematic botany of some kind among the very essentials of human speech and writing, whensoever plants are to be considered. This, apparently the true philosophy of the origin of the science, and of its history, seems to be Doctor Greene's own.

Directly following a short chapter on earliest traces of philosophic botany in very ancient Greek writing, there is a long one on Theophrastus of Eresus, whom the most competent botanical scholars, up to less than a hundred years ago agreed in styling the Father of Botany as a science; whom also our later generations have known nothing of. To the readers of Doctor Greene's *Landmarks* it will appear as if the fundamentals of even modern botany had been settled, set forth in public lectures at ancient Athens, and written into a book by this philosopher two and twenty centuries ago.

The chapter on Theophrastus occupies 90 pages, and is the largest one in the volume. The leading paragraphs of the chapter are in the following succession, and the eye is guided to each by special type: **Life, Method** (in general), **Vegetative Organography, Anthology, Fruit and Seed, Anatomy, Phytography, Taxonomy, Nomenclature, Ecology, Dendrology, Transmutation** (of species, and even genera).

As a contribution to the written history of our science all this matter is new, and will be apt to prove instructive reading to most

of us; for we have been taught, often enough by definite precept, and always and everywhere by implication, that scientific botany had no being until 150, or at farthest 200 years ago.

After the time of Theophrastus the most notable epoch in the advance of botany was that inaugurated in the first half of the sixteenth century; a movement in which certain German professors and physicians had a conspicuous part. These are Brunfels, who lived between 1464 and 1534, Fuchs, 1501–1566, Tragus, 1498–1554, and Valerius Cordus 1515–1544. The German historians of botany, three or four of them, have designated this quartette of celebrities the German Fathers of Botany. This title is conceded them, though with some reluctance by the author of the new *Landmarks;* or, if not exactly with reluctance, at least with some discernment; for the four celebrities, by the careful analysis of the work of each, are seen to fall into two rather distinct categories, so that to Brunfels and Fuchs there is accorded the title of German Fathers of plant Iconography only, while Tragus and Cordus only are accredited as German Fathers of Botany. It is a piece of discrimination that is new; and it amounts to a judgment of the comparative merits of the four which is quite opposite of that to which German historians themselves had arrived; for these almost with one accord make of Brunfels and Fuchs the greatest promoters of botany, holding Tragus and Cordus in less esteem. But in truth, Brunfels and Fuchs did little more than employ excellent artists to draw and picture plants, then proceeded to edit the engravings, accompanied by rather imperfect descriptions borrowed from the ancient Greeks and Romans. But by virtue of the engravings representing some hundreds of plants with a faithfulness to nature which was a new thing in the world, the two folios, that of Brunfels in 1532 and Fuchs in 1542, were immediately successful, immensely fostering a new interest in plants, and this not so much, it may be, among the learned, as among the common people and the illiterate; for not even the rudiments of an education are requisite for the identification of an herb or tree if comparison can be made with a good figure, and there is no need of becoming able to read and understand the description. The two were great popularizers of plant knowledge, at the time; their folios were financially successful; matters which, after all, do not necessarily make very much for the advancement of botany as a science.

Quite the opposite of this were the minds and the works of

Tragus and Valerius Cordus, it would seem; for these are said to have pursued the gathering and studying of plants for the love of plants; and that when each began to think of writing a book, the purpose in either case was, not to employ draftsmen and engravers, but so carefully and faithfully to describe each plant from nature that, to all who could read, the species might be identified by description alone. The folio of Tragus was published first in German, and made so strong an impression by virtue of the life-like picturing of plants by words, as well as by a vast amount of new information conveyed, that the learned botanical world seemed to demand all this in Latin, then still the language of the educated everywhere; and such an edition was given, and even illustrated by many wood cuts, largely copied in smaller size from Fuchs. Valerius Cordus was the last of the four German Fathers, and is usually treated by even German historians as the least among them. Sachs even passes him by with a remark that he was of no importance. Nevertheless, in the judgment of the author of the *Landmarks*, he was by far the ablest and most accomplished of them all, as well as the one who most advanced philosophic and real botany. His description of plants,—both ancient and classic plants, as well as new German species by the score or hundred—are now everywhere seen to far surpass those of any and all of his predecessors. The author of this volume of history reports that Cordus was the first of botanical investigators to note the mode of the enfoldment of any leaves in the bud, and of petals in flower buds; the first to distinguish anther-dust and call it pollen; first to affirm that ferns propagate by the dust on the back of leaves, and to state that this generative dust is not of the same structure as seed. All this, too, long before the invention of the microscope, hand lens, or spectacles. He is accredited as the actual first discover of such familiar types as *Caltha palustris* and *Parnassia palustris* and the cranberry vine, to which also he gave the generic name *Oxycoccus*, which it still is known by. Even the snowball bush, *Viburnum Opulus* variety, which was first seen by Cordus in a German mountain wilderness, and was named by him as a mere variety of the bush called upland cranberry. He was first to describe the sundew, and to publish a report on the nature of the so-called dew on its leaves. The term papilionaceous we appear to owe to Cordus, who is shown to have invented it—to have used it often, and even to have determined as true leguminous plants, certain

small flowered ones whose fruits were not legumes strictly speaking. Being geologist and mineralogist, he is first among botanists to mention, in his ecologies of certain plants, the geologic formation, or at least the probable constituents of the soil in which they grow.

Throughout the volume, the work of each maker of a botanical landmark is analyzed, and the particular lines along which each wrought most are, as we have indicated above, made subjects of special paragraphs, each paragraph showing its caption in prominent type. The first of these paragraphs is always that of the Life of the botanist. These biographic sketches are more full by far than is usual in such history, and will doubtless be read with interest by all botanists, if not even by the unbotanical.

The work will shortly appear, and will form a part of Volume 54 of the Smithsonian Miscellaneous Collections

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Editorial Notes.

CHANGES IN PLANT NAMES.

It may be seriously questioned whether in ruling that plant names must begin with the date of Linnaeus' Species Plantarum of 1753, more confusion has resulted than had ever been anticipated. More changes in nomenclature have been made since botanical congresses have convened than before it was deemed necessary to legislate in this matter. Every time a congress meets we are sure that as the result of its artificial decisions a number of well established names will go. The Vienna Congress decided that "nomenclature should not be arbitrary nor imposed by authority" (Art. 3) but based on priority. (Sect. 1, Art. 15) Apart from the fact that one of the first rules (Art. 19) absolutely precludes the idea of priority there can be no more arbitrary decision possible than the statement of Article 20.

"*However, to avoid disadvantageous changes in the nomenclature of genera* by the strict application of the rules of Nomenclature and especially of the principle of priority in starting from 1753 the rules provide a list of names which must be retained in all cases. These names are by preference those which have come into general use in the fifty years following their publication, or which have been

used in monographs and important floristic works up to 1890. The list of these names forms an appendix to the rules of Nomenclature."

The obvious reason for this arbitrary and sweeping exception to the law of priority since 1753 "*is to avoid changes in nomenclature.*" Has this been affected? As the rule may be and actually has been interpreted any change may still be made of a plant name which according to the rule is not in the list though it may have been in use up to 1890 for fifty years. In Gray's Manual, seventh edition, we find several such changes, and changes of names that had been up to the present time in use, *for not only fifty years but actually, in one case, for one hundred and fifty years!* Such changes are moreover, made by those who claim that they have "*scrupulously* endeavored to bring the nomenclature of the manual in accord with the Vienna agreement in order that American nomenclature may be freed as speedily as possible from peculiarity or provincialism, and assume the form which has received international sanction."*

Limnanthemum was applied as a name of a segregate genus from the Linnaean *Menyanthes* by Gmelin in 1769, and there has been no other name used for it as a separate genus, up to 1908, the year of the seventh edition of Gray's Manual. It was found, however, the *Limnanthemum* had not priority and a name completely forgotten, *Nymphoides*, Hill 1756 substituted. As the name has priority no one could object to it except for etymological reasons which Linnaeus † gave more than a century and a half ago.

Whatever the reason there be for changing *Ulmaria* to *Filipendula*, the latter is new and the former has been used for more than a hundred years. Added to this *Ulmaria* is as a matter of fact as old as *Filipendula* even since 1753, both having been published by Hill, in 1756.‡

The best reason why *Nymphoides* can be used for *Limnanthemum* according to the rules is that it is not on the list of condemned names, though we feel sure that had that eminent assembly thought of the name it would certainly have been put on the list. The only way to do away with it according to international rules is for botanists to assemble again and condemn it.

I do not wish to cast a slur either on congresses which are not

* Gray's Manual, 7th edition, 1908, Preface, p. 7.

† Hill, J. British Herbal. 1756.

‡ Linnaeus, C. Historia Botanica, 1751-1754.

supposed to be omniscient nor on editors who "scrupuously follow their rules," but the moral of the present discussion is that botanical congresses no matter how often they meet and how many rules they make, will never do what they set out to do; namely, "avoid disadvantageous changes in nomenclature."

On the whole we are inclined to think, after carefully studying the history of these changes, that fewer would be made by going back to the only fundamental reasonable principle of nomenclature, namely; *absolute historical* priority, not limited to 1753, but going back as far as we have any certain indisputable proof of the identity of plant names. The "starting point" 1753 in nomenclature, has been made to avoid confusion of names of genera, but results so far have not been forthcoming and it is safe to say that no more radical changes of names could or would result if we disregard entirely the artificial and unreasonable "starting point," 1753, as it is evident from such works as S. F. Gray's, 1821, E. L. Greene's, Flora Franciscana, and Bay Region Botany, or Bubani's Flora Pyrenaea, or Tidestrom's Elysium Marianum the principle of whose nomenclature goes back to even Theophrastus, Dionscorides, Galen, Pliny, Varro, Vergil, Dodonaeus, Lobelius and Brunfels for valid names of genera.

THE CODE OF THE NEAR FUTURE.

We have some very strong reasons to believe that it will be only the matter of a few years when botanists will come to see the futility of the contradictory codes in question of nomenclature. The Vienna Code was not expected to satisfy everybody by its arbitrary decrees, well meant though they be. American botanists especially are not satisfied, and already amendments have been proposed. Best of all we feel that it is becoming more apparent daily that the codes are not only not doing what the set out to do,—bring about uniformity, but they are actually "making confusion worse confounded." American botanists are pondering this matter deeply at present, and very little is being said in public. Every one that does consider the matter philosophically realizes that the codes must eventually come to the *principle of absolute historical priority* in matters of *biological nomenclature*. All artificial "starting points" of dates before which no names are to be taken, are coming to be looked upon as illogical. The leaven of truth is slowly fermenting in minds that are responsible for the science of the times, and it will not be very long before results show. It is to be questioned whether the actual changes of names necessary to be made to bring absolute historical priority of names into effect, would be many more than the exceptions to

article 20 of the Vienna Code. Linnaeus, almost as a rule, chose the names of the older botanists before him, and the number of changes would be comparatively insignificant, especially in our American flora. This fact is only too evident from consulting the works of Dr. E. L. Greene, *Flora Franciscana* and *Bay Region Botany*.

Serious minds are beginning to realize also that if we must eventually come to the principle of unrestricted priority in time, it might as well come soon. Already there are proposals for artificial "starting points" for the other different branches of systematic botany, so that one date is proposed for Mycology, another for Algology, and if we follow the illogical suggestions we must have as many "starting points" as there are divisions of systematic botany. A generation and more has Dr. E. L. Greene stood up for the principles of absolute historical priority and we have good reason to think at present that he will yet see this the prevailing sentiment in public as it is tending to become so in private. More than two decades did Pietro Bubani spend on that colossal work of his, so little known, yet withal so erudite, in spite of a number of eccentric inconsistencies, his *Flora Pyrenaea;* whose principle is that of historic time priority, and even then it was published after the author's death. The way to the truth then is already broken through the dark forest of error, but we must await some bold genius that dares follow the trail. We could name not a few, if we would, great botanists too, whose ideas on this question are correct, whose private opinions are more logical than their public expressions, and accordingly we know that the day is not far distant, when codes will be discarded and the only guide will be the principle of absolute and certain historical priority in nomenclature.

News Notes.

Prof F. L. Charles, of the University of Illinois, is to be the new secretary and editor of the *American Nature Study Review.* The Society through this, its official organ of publication proposes giving considerable attention in the future to the question of agricultural teaching in elementary schools.

Mr. Ivar Tidestrom, of the U. S. Department of Agriculture, has been engaged during the past summer in making extensive journeys studying the flora of Utah, Idaho and Montana. Special investigation has been made of the flora of Utah for some years by him, and we hope his work will eventually culminate in a manual of botany of that state. He has also been doing research work on the noxious and poisonous plants of that region.

Dr. J. A. Nieuwland, Professor of Botany in the University of Notre Dame, spent the Summer in the study of the flora of the Willamette Valley in Oregon, making collections of plants in that country. Summer school work was also done at Columbia University, Portland, Ore.

Dr. Edw. L. Greene, Honorary Associate of the Smithsonian Institution, made, during the Spring, a botanical tour of several weeks through Indiana, Illinois, southern Michigan and Ontario. He made a special investigation of the violets and antennarias, also a general ecological study of the country. Many problems regarding the habitat of his new species, already published, from this region were cleared up.